EXHIBIT 2
DATE 4/6/09
SB 498

A Productive Alternative to Carbon Sequestration

Dale P. Ferguson

Evidence is mounting that CO2 levels may be the result of climate change, not the cause of it. The issue of climate change is *not* settled. Carbon sequestration is an expensive farce.

However, even if carbon dioxide *is* a problem, does it make sense to inject CO2 into the ground when very little effort is being made to stop it from coming out of the ground in the first place?

I'm talking about coal mine fires. Below is an article, "Fire in the Hole" by Kevin Krajick from Smithsonian Magazine for May 2005. It gives a brief summary of all the coal mine fires that are burning throughout the world. China is by far the worst offender with India second. These nations get a free pass in the Kyoto Treaty. One of my e-mail buddies who traveled extensively in the interior, said he was "glad to be out of smog-filled China."

Also below is a more recent article from McClatchy Newspapers describing China's mine fires in more detail.

Here in this country there are over 50 fires burning in Pennsylvania alone. The Flathead Beacon for 3-16-09 (article attached) says that at least nine coal-seam fires are burning in eastern Montana, as reported by our own Department of Environmental Quality. American technology was used to put out oil well fires in Kuwait in a few weeks when the "experts" predicted it would take years. We should be able to tackle coal mine fires easily if a serious effort is made.

Sequestered carbon will, no doubt be relatively clean, its source having been subjected to already expensive pollution controls. Coal mine fires are maximum polluters, emitting mercury, sulfur, cadmium, lead, etc. along with CO2.

Incredibly, the Intergovernmental Panel on Climate Change (IPCC) makes no mention of coal mine fires. I have searched several chapters of their Fourth Assessment Report and found none.

The following link presents some good arguments against carbon sequestration:
http://www.treehugger.com/files/2006/07/carbon_sequestration.php
Important! Why Carbon Sequestration Won't Save Us,
by Michael Graham Richard, Gatineau, Canada on 07.31.06

Mr. Richard says, "I used to think that it would indeed be one of the many solutions used to save ourselves from catastrophic climate change, but not anymore. In fact, I now think that it might be a counter-productive red herring."

Most of his article consists of quotes from "The Weather Makers" by Tim Flannery, and describes the technology and facilities required to capture, transport, and inject CO2. The energy required will be a significant fraction of the amount generated. Wells aren't cheap to drill, and pipelines are typically a million dollars per mile. Since he really believes that climate disaster is imminent, he claims the time required to implement all this, is time we don't have.

Remember, this is from a Website called "Treehugger."

Seriously, now, wouldn't it be a lot cheaper and more productive to plant trees near power plants? "Biosequestration" appears to be an official term; Google it and see what you get.

It matters not whether I'm a tree hugger, or a laissez-faire capitalist, I am most concerned about the mercury, lead, cadmium, and other elemental (and, therefore non-degradable) pollutants emitted by coal-seam fires. Let's keep the toxic elements in the ground by using our carbon budget to put out those fires.

An increasing number of scientists are concluding that CO2 has no effect on climate. If true, we will have spent, in vain, a tremendous amount of technological effort to build a huge, expensive, and useless infrastructure. On the other hand, the effects of coal-seam fires are obvious. The technology developed to extinguish them will be useful whether we have an ice age or another Medieval Warm Period.

So, PLEASE, I'm asking those of you in a policy-making position to go after the big sources first, before you try to micro-manage my flatulence.

Dale P. Ferguson
376 Mission View Drive
Polson, MT 59860
406-883-9289
dalepf@montanasky.net

Why Carbon Sequestration Won't Save Us

by Michael Graham Richard, Gatineau, Canada on 07.31.06

{Note by Dale Ferguson: This article was copied from http://www.treehugger.com/files/2006/07/carbon_sequestration.php, It consists mostly of quotes from "The Weather Makers," by Tim Flannery. On first reading it wasn't obvious to me that Michael Graham Richard was quoting Tim Flannery; the formatting is obscure (maybe because we have an American reading a Canadian quoting an Australian). The "Treehugger" Website wouldn't permit this piece to be printed, so I copied and pasted, and then reformatted for readability.}

Carbon sequestration, also known as geosequestration, seems like a good deal. "Have your carbon cake and eat it too." In principle, it works this way: You capture CO2 emissions at the source before they are released into the atmosphere, compress them until they become liquid and then inject them in deep underground holes. What could be simpler? It certainly sounds like a good tool to fight global warming while enjoying the Earth's huge coal reserves.

I used to think that it would indeed be one of the many solutions used to save ourselves from catastrophic climate change, but not anymore. In fact, I now think that it might be a counter-productive red herring. What has made me change my mind? What's the problem? Read on, please.

Tim Flannery, in his highly recommended book The Weather Makers, dedicates a chapter to engineering solutions to global warming. In it, he gives an overview of carbon sequestration technology, the problems that have to be solved before it can work, and what the coal industry has been doing so far.

Here are the problems in order:

First, from the smokestack:

> *"The stream of CO2 emitted there is relatively dilute, making CO2 capture unrealistic. The coal industry has staked its future on a new process known as coal gasification. These power plants resemble chemical works more than conventional coal-fired power plants. In them, water and oxygen are mixed with the coal to create carbon monoxide and hydrogen. The hydrogen is used as a fuel source, while the carbon monoxide is converted to a concentrated stream of CO2. These plants are not cheap to run: around one-quarter of the energy they produce is consumed just in keeping them operating. All indications suggest that building them on a commercial scale will be expensive and that it will take decades to make a significant contribution to power production.*
>
> *"So about 25% of the energy they make is used just to keep them operating, they are more expensive and it will take decades (an amount of time we don't have) before they make a significant contribution. Meanwhile, old coal power plants have an average lifetime of 60 years."*

What's next?

> *"Let's assume that some plants are built and the CO2 is captured. For every tonne of anthracite [coal] burned, 3.7 tonnes of CO2 is generated. If this voluminous waste could be pumped back into the ground below the power station it would not matter as much,*

but the rocks that produce coal are not often useful for storing CO2, which means that the gas much be transported. In the case of Australia's Hunter Valley coal mines, for example, it needs to be conveyed over Australia's Great Dividing Range and hundreds of kilometres to the west. [pipelines cost about $1 million per mile, more when terrain is rough and uneven.]

"Once the CO2 arrives at its destination it must be compressed into a liquid so it can be injected into the ground—a step that typically consumes 20 per cent of the energy yielded by burning coal in the first place. *Then a kilometre-deep hole must be drilled and the CO2 injected.* ***From that day on, the geological formation must be closely monitored;*** *should the gas ever escape, it has the potential to kill. [...]*

"The largest recent disaster caused by CO2 occurred in 1986, in Cameroon, central Africa. A volcanic crater-lake known as Nyos belched bubbles of CO2 into the still night air and the gas settled around the lake's shore, where it killed 1800 people and countless thousands of animals."

Okay, so even more energy is lost by compressing the CO2 to liquid form and we must monitor for leaks. What else?

"Earth's crust is not a purpose-built vessel for holding CO2, and the storage must last thousands of years so the risk of leak must be taken seriously.
Even the volume of CO2 generated by a sparsely populated country such as Australia beggars belief. Imagine a pile of 200-litre drums, ten kilometres long and five across, stacked ten drums high. [1.3 billion drums] Even when compressed to liquid form, that daily output would take up a cubic kilometre, and Australia accounts for less than 2 per cent of global emissions! ***Imagine injecting 50 cubic kilometre of liquid CO2 into the Earth's crust every day of the year for the next century or two.***

"If geosequestration were to be practised on the scale needed to offset all the emissions from coal, the world would very quickly run out of A-grade reservoirs near power stations and, especially if the power companies are not liable for damages resulting from leaks, pressure would be on to utilise B, C, D and E grade reservoirs."

Okay, so burying it in the ground is not so simple or safe—as the oil industry likes to remind us, drilling is expensive—and it's not a long-term solution since we will run out of convenient places to sequester the liquid CO2. Anything else?

"All of this suggests that the best case scenario for geosequestration is that it will play a small role (at most perhaps 10 per cent by 2050) in the world's energy future.

"Because action is needed now to combat climate change, both the public and the marketplace need to see proof of geosequestration's potential. ***Big coal should already be building trial coal gasification plants with geosequestration as a test of the economic and technological viability of their approach. Yet, despite offers of government assistance, very little is happening with geosequestration.*** *[...]*
Imagine the cost of building the new generation coal gasification power plants, the separation, storage, pipelines, compressors and injection wells."

So they're not even rushing to test it and make it happen?

> *"Politicians have been seduced by the coal industry's spin. [...] the Australian government set up [behind closed doors] a $500 million research fund for low emission technologies, precisely tailored in its brief to accommodate geosequestration.* ***That's half a billion dollars that will never be fairly shared between all energy options to ensure the best outcome for the nation.*** *[...]*
>
> *"What is at stakes is [...] that Australia must increase its power production by more than 50 per cent by 2020 (a slow rate of growth compared with China [the biggest coal user in the world]), and the coal industry would like to secure as large a share of the cake as possible."*

All this talk of carbon sequestration can basically be seen as a delaying tactic, as a way to get government support and to keep the operation and construction of coal power plants more socially acceptable. It's the equivalent of saying: "Don't bother us, we're working on it!"

But even if we suppose that big coal starts to build the expensive gasification plants soon and that they can solve most of the technical problems with geosequestration, they are not saying that they want to replace old, extremely dirty plants with the new ones; they want to build new ones and keep the old ones. They almost certainly won't bear the liability of CO2 leaks from underground storage, so that's an extra cost for taxpayers, not to mention that the electricity coming from coal gasification plants that do carbon sequestration will be more expensive because a lot of energy is lost in the process of running the plants, in the actual sequestration operating, and the huge costs of building the pipelines, the plants, drilling the holes, maintenance & monitoring, etc, will be passed on to the customers (or they'll ask for subsidies—same difference).

So it'll take decades which we don't have, be extremely expensive, probably won't work that well, and we'll run out of good burying sites before long. Meanwhile, the clean energy industry (solar, wind, wave, geothermal) will keep growing very fast at exponential rates, their costs will keep going down and the efficiency of their production units (wind turbines, solar panels, hydrokinetic buoys, Gorlov helical turbines, geothermal heat pumps) will keep going up.

The fastest and cheapest way to close down coal plants soon is probably investments in efficiency. Remember, it's a lot cheaper to save a watt of electricity than to produce one.

As a ~~society civilization~~ [sic] species, we must back the right horse and stop being misled by the coal industry's delaying tactics. There's a big opportunity cost in time and resources to going down the wrong path. Each new power plant big coal builds means decades of fat profit for it, but for the rest of us here on Earth, it's just bad, bad news.

Fire in the Hole

Raging in mines from Pennsylvania to China, coal fires threaten towns, poison air and water, and add to global warming

By Kevin Krajick
Smithsonian magazine, May 2005

From the back kitchen window of his little house on a ridge in east-central Pennsylvania, John Lokitis looks out on a most unusual prospect. Just uphill, at the edge of St.IgnatiusCemetery, the earth is ablaze. Vegetation has been obliterated along a quarter-mile strip; sulfurous steam billows out of hundreds of fissures and holes in the mud. There are pits extending perhaps 20 feet down: in their depths, discarded plastic bottles and tires have melted. Dead trees, their trunks bleached white, lie in tangled heaps, stumps venting smoke through hollow centers. Sometimes fumes seep across the cemetery fence to the grave of Lokitis' grandfather, George Lokitis.

This hellish landscape constitutes about all that remains of the once-thriving town of Centralia, Pennsylvania. Forty-three years ago, a vast honeycomb of coal mines at the edge of the town caught fire. An underground inferno has been spreading ever since, burning at depths of up to 300 feet, baking surface layers, venting poisonous gases and opening holes large enough to swallow people or cars. The conflagration may burn for another 250 years, along an eight-mile stretch encompassing 3,700 acres, before it runs out of the coal that fuels it.

Remarkably enough, nobody's doing a thing about it. The federal and state governments gave up trying to extinguish the fire in the 1980s. "Pennsylvania didn't have enough money in the bank to do the job," says Steve Jones, a geologist with the state's Office of Surface Mining. "If you aren't going to put it out, what can you do? Move the people."Nearly all 1,100 residents left after they were offered federally funded compensation for their properties. Their abandoned houses were leveled. Today Centralia exists only as an eerie grid of streets, its driveways disappearing into vacant lots. Remains of a picket fence here, a chair spindle there—plus Lokitis and 11 others who refused to leave, the occupants of a dozen scattered structures. Lokitis, 35, lives alone in the house he inherited from "Pop"—his grandfather, a coal miner, as was Pop's father before him. For fans of the macabre, lured by a sign warning of DANGER from asphyxiation or being swallowed into the ground, Centralia has become a tourist destination. For Lokitis, it is home.

Across the globe, thousands of coal fires are burning. Nearly impossible to reach and extinguish once they get started, the underground blazes threaten towns and roads, poison the air and soil and, some say, worsen global warming. The menace is growing: mines open coal beds to oxygen; human-induced fires or spontaneous combustion provides the spark. The United States, with the world's largest coal reserves, harbors hundreds of blazes from Alaska to Alabama. Pennsylvania, the worst-afflicted state, has at least 38—an insignificant number compared with China (see sidebar, "Flaming Dragon," p. 58) and India, where poverty, old unregulated mining practices and runaway development have created waves of Centralias. "It's a worldwide catastrophe," says geologist Anupma Prakash of the University of Alaska at Fairbanks.

Some of the underground fires are natural occurrences. When coal, exposed at or near the surface by erosion, combines with oxygen, a chemical reaction produces heat. That process can build for years; low-grade, soft coals—crumbly and low in carbon—can spontaneously combust, at temperatures as low as 104 degrees Fahrenheit. Lightning or a brush fire can also ignite soft coal. The fires burn downward, acquiring air through fissures in rock and microscopic spaces between grains of dirt. An underground fire may smolder for years, or even decades, without showing signs on the surface. Eventually, however, in a process called subsidence, burning subterranean coal turns to ash, creating huge underground voids and causing overlying ground to crack and collapse—thus allowing more air in, which fans more fire. Much of the landscape of the American West— its mesas and escarpments—is the result of vast, ancient coal fires. Those conflagrations

formed "clinker"—a hard mass of fused stony matter. Surfaces formed in this way resist erosion far better than adjacent unfired ones, leaving clinker outcrops. Many ancient fires like those still burn, from the Canadian Arctic to southeast Australia. Scientists estimate that Australia's BurningMountain, the oldest known coal fire, has burned for 6,000 years. In the 19th century, explorers mistook the smoking summit for a volcano.

Natural though the fires may be, humans intensify the scale. China, for example, supplies 75 percent of its energy with coal as it hurtles toward industrialization. Due to mining of its vast coal fields, fires are spreading. Estimates vary, but some scientists believe that anywhere from 20 million to 200 million tons burn there each year, producing as much carbon dioxide as about 1 percent of the total carbon dioxide from fossil fuels burned on earth. Another human intensifier: rural Chinese people tend to hand-dig household coal from hundreds of thousands of surface locations, then abandon them when the cavities get too deep. The practice leaves the earth punctured by countless small pits; inside, loose coal chunks and powder are exposed to air, making them highly combustible.

Beginning in 1993, Chinese scientists joined with Dutch and, later, German researchers to map China's coal fires from satellites and aircraft, leading to the discovery of many new fires. "We know there are thousands, but it is too hard to count," says Stefan Voigt, a geographer at the GermanAerospaceCenter near Munich. Extinguishing the fires would require heavy equipment to dig them out and smother them with soil—but China is still largely dependent on picks and shovels. "The Chinese recognize the problem," says Voigt, "but sometimes they'll say: 'We don't need more science. We need more *bulldozers*.' "

China has the most coal fires, but India, where largescale mining began more than a century ago, accounts for the world's greatest concentration of them. Rising surface temperatures, and toxic byproducts in groundwater and soil, have turned the densely populated Raniganj, Singareni and Jharia coal fields into vast wastelands. Subsidence has forced relocations of villages and roads—then re-relocations, as fire fronts advance. Rail lines give way; buildings disappear. In 1995, a Jharia riverbank was undermined by fire and crumbled; water rushed into underground mines, killing 78. Perhaps the most terrifying spectacle is the unquenched fire itself: many blazes smoldered quietly in old underground tunnels until recently, when modern strip pits exposed them to air. The revitalized flames erupted, engulfing the region in a haze of soot, carbon monoxide and compounds of sulfur and nitrogen. Burning coal also releases arsenic, fluorine and selenium. (Studies in China have suggested that the millions of people who use coal for cooking are being slowly poisoned by such elements.) Even so, workers continue to labor in this highly toxic environment.

And despite a 1990s World Bank study that outlined measures to combat the fires, little has been done to address the problem in either China or India. Prakash and other experts blame bureaucracy, corruption and the sheer overwhelming scale of the problem. "It's just crazy," she says.

Mining is not the only human intensifier of the fires. In Indonesia, huge tracts of land once covered by rain forest— and underlain by near-surface coal—is fast being logged, then cleared for agriculture. The preferred method: fire. The practice has ignited perhaps 3,000 coal fires since 1982, destroying houses, schools and mosques. Heavy smoke carpets much of Southeast Asia, blocking out sunlight and causing crop failures as well as reducing visibility and, in at least one case, triggering an oil-tanker collision. The smoke is also implicated in an epidemic of asthma. On a smaller scale, a related phenomenon has occurred in the United States; near Glenwood Springs, Colorado, for example, an old coal mine has burned for the past 100 years. In the summer of 2002, the blaze ignited a forest fire that consumed 12,000 acres and 43 buildings. Putting it out cost $6.5 million. And the mine still burns.

Generations of engineers and geologists have puzzled over how to fight these behemoths. "We've learned the hard way— total excavation is usually the only thing," says Alfred Whitehouse, a geologist with the U.S. Office of Surface Mining (OSM). Last year, when range fires near Gillette, Wyoming, set off 60 blazes in coal outcrops, the federal Bureau of Land Management sent a helicopter to map hot spots, then used heavy equipment to dig out the burning fires. It worked. "Those fires are nasty little rascals. You can't let 'em go," says Bud Peyrot, a rancher who has bulldozed a number of hot spots on his place.

But extinguishing relatively small underground fires with bulldozers and backhoes is one thing. Dealing with firebreathing monsters the size of the one in Centralia poses an altogether different magnitude of challenge. Eastern Pennsylvania sits on the world's greatest deposits of anthracite—shiny, hard, clean-burning, high-BTU coal in deep beds, squeezed and twisted by the formation of ridges like the one that rises behind John Lokitis' house. In the 19th and early 20th centuries, miners reached the anthracite deposits through mazes of tunnels,

shafts and gangways. If a fire got started in them, miners were usually able to extinguish it before it spread. Then oil and gas replaced anthracite as premier home heating fuels. By the 1950s, most Pennsylvania anthracite mines had been abandoned. Entrances caved in; tunnels began to fill with rubble. Later, strip miners with modern equipment came at the coal from the surface, but they could never reach it all. The result was a landscape of stony debris on top of leftover underground coal laced by interconnected airways—a perfect setting for a coal fire.

The Centralia fire probably got going in May 1962, when local sanitation workers began burning trash at a site over an old mine entrance just outside town, igniting the underlying coal. Over some 20 years, firefighters tried eight times to put it out. First they dug trenches, but the fire outpaced them. Then they attempted "flushing"—a process that involves augering holes into or ahead of a fire, and pouring down wet sand, gravel, slurries of cement and fly ash to cut off oxygen. (Flushing nearly always fails because of the difficulty of filling every pore space. In addition, because coal fires can exceed 1,000 degrees F, most fill material burns away, leaving more gaps. For both of these reasons, the flushing attempt did not succeed.) Next, state and federal geologists drilled hundreds of exploratory boreholes to define the fire, then dug a huge trench across its supposed path. But the fire had already spread beyond the trench. Some critics believe the digging helped ventilate the fire.

Flooding the area with water was rejected: it is nearly impossible to inundate a large underground area, especially one as complex and well drained as Centralia. In any case, water would have had to be pumped in for years to dissipate the fire's heat. Afinal solution, to dig a pit three-quarters of a mile long and deep as a 45-story building, would have cost $660 million, more than the value of property in town. It, too, was rejected.

Within a few months, the Centralia fire, which began on the town's outskirts, had spread to its southern edge. At first, this development seemed more curious than calamitous. Kathy Gadinski, then 25, recalls harvesting tomatoes at Christmas from her naturally heated garden. Some folks no longer had to shovel snow. Then things took an ominous turn: residents began passing out in their houses—from carbon monoxide leaking in through their basements. Next, the underground gas tanks at Coddington's Esso gas station, near St. Ignatius Church, started heating up. Route 61, the main road into town, dropped eight feet, and steam spurted out of cracks in the pavement. Then, in 1981, 12-year-old Todd Domboski was crossing through a resident's backyard when a hole opened: he slid out of sight into a dense cloud of gases. The boy saved himself by clinging to a tree root until a cousin pulled him out. After that, just about everyone in Centralia accepted the most radical solution of all: let the mine burn. Most residents took the federal buyout and moved to neighboring towns; more than 600 buildings were demolished. "Putting it out is the impossible dream," says Jones.

In 1992, the town's remaining buildings were condemned; the state took title to Centralia. Lokitis and other die-hards became squatters, but authorities have not evicted anyone. Most of those who have chosen to remain are elderly, and "that would be very bad publicity," says Lamar Mervine, Centralia's flinty, 89-year-old mayor. "They don't want another Waco here." (That, he adds, was a joke.) It's just that he and his wife, Lanna, also 89, like Centralia, even without many neighbors. With much of the demolition zone grassy and still visibly unaffected, they doubt the fire will reach their 15-foot-wide house, now splendidly isolated at 411 South Troutwine Street.

But Jones says everyone should have moved out years ago. Those who stay, he warns, could die any time from poison gases, whether there's a fire under their property or not. On a recent tour of Centralia, Jones told me that the fire has spread to some 400 acres, growing like an amoeba, about 75 feet a year, along four separate arms. The blaze is most evident along the St.IgnatiusCemetery. The church was pulled down in 1997, but former residents still inter loved ones in the 138-year-old graveyard. (The local joke is that you can get buried and cremated at the same time, no extra charge.) "Actually," says Jones, "I don't think the cemetery itself is on fire. Except maybe that one little corner there."

He points to empty plots where the grass is brown. Above steaming sinkholes lie heaps of hot, recently extruded clinker. Jones' colleague, geologist Timothy Altares, sloshes water onto it: the liquid vaporizes. Then Jones spots a lone metal post—the remnant of a DANGER sign he once posted there. "People keep stealing souvenirs," he growls. Tourists, he says, print directions from Internet sites and wander around snapping photographs. "This is a bad place. One day someone's going to disappear down a sinkhole."

Jones cannot say exactly where the fire is now—its perimeter is beyond the boreholes dug to define it. He believes it has crossed Big Mine Run Road, a short drive outside town, and is heading east. (A roadside sandstone cliff glowed cherry red for a while but now merely wisps

steam.) Route 61, on the southwest limb of the fire, remains buckled and steaming; the state has created a detour through neighboring Byrnesville, also virtually abandoned, where just about the only landmark left is a shrine to the Virgin Mary, still maintained by the Reilley family, who no longer live here.

Some residents of nearby towns, such as Mount Carmel (pop. 6,389), fear the fire will reach them, but experts believe it will run out of fuel or hit groundwater before it does. Afew miles southwest of Centralia, two separate fires burn deep under mine waste near the village of Locust Gap. So far, the blazes seem confined to about a dozen acres, and it is hard to find surface evidence of them. Gary Greenfield, a geologist who works with Jones, says he doesn't think either of them will reach any houses, but he admits that predicting underground fire paths is like predicting the weather. "I don't think Locust Gap will become another Centralia," he says. "At least not right away." To the east, a fire has burned for at least 25 years near Shenandoah, opening fissures and emitting fumes, but so far causing no damage in the town itself.

Not all of the fires are left to burn; when a blaze threatens buildings or roads, OSM tries to contain it. And often when a new fire is discovered, firefighters may succeed in putting it out. Driving north on Interstate 81 from Wilkes- Barre in his pickup truck, OSM mining engineer David Philbin pointed out grassy spots where the agency replanted vegetation after a fire had been successfully extinguished. On the outskirts of Carbondale, he showed me his greatest triumph: the former Powderly Mine, where a fire of unknown origin broke out in 1995. The agency spent $5.5 million and seven years blasting and moving rock to carve a C-shaped trench 2,150 feet long, 70 feet wide and 150 feet deep. Philbin thinks the fire may burn another 20 years behind the trench but should eventually go out. "My finest moment," he grins. "I'm the architect of this hole."

Digging it was dangerous. Frontloader drivers carried emergency oxygen masks as they ripped smoking coal from the fire edge. The vertical walls of the trench could drop tenton boulders. Even now, as heat bakes and cracks the "hot" side of the trench, giant shards regularly split off. Philbin led the way down through a gap in the fence on the hot side, past steaming fissures and hot rock faces. At the base of the trench wall—where three of Philbin's colleagues refused to accompany us—lay hundreds of tons of fresh rockfall. "Well, to outwit a fire, someone's gotta stick his nose in," he said, clambering over debris. In the trench walls were intact coal seams and old tunnel timbers that had not burned. "I like this," Philbin said. "There's adventure here. Some Sherlock Holmes. We think it's contained. But of course a lot of people have been fooled by these things. Personally, I'd like to dig the whole thing out."

Philbin will likely never get the chance. Funds are limited, and to a certain degree, coal field residents who are in no immediate danger accept fires as part of the backdrop, like subway noise in New York City or drizzle in Seattle. On the slope behind Philbin's Wilkes-Barre office, another fire, the forgotten cousin of Centralia, has been smoldering in Laurel Run since 1915. Every attempt to put it out has failed. When gases erupted under one neighborhood in the 1960s, nearly 200 buildings had to be demolished, including 178 houses. Today that section of Laurel Run is a wasteland, frequented by illegal garbage dumpers and teens on all-terrain vehicles. But many people still live in adjacent neighborhoods. The access road to a nearby mobile-home park occasionally slumps, necessitating repairs. "I know if you're from somewhere else, it seems strange, but to me it's nothing unusual," says resident Gene Driscoll, 49, a construction worker who lives at the park. "I've seen fires all my life. No one really worries about it."

But it's a different story in Centralia, where just about every year the little band of holdouts is reduced by death or departure. Lokitis, a civilian accountant for the state police, has been the only resident on WestPark since his neighbors, Bernie and Helen Darrah, died in 1996. The Darrahs' house still stands, but the rest of the street is lined with lots vacant except for grass, a patch of backyard forsythia and the town's small monument to its war veterans. Still, Lokitis points out that the fire has never actually killed anyone. In fact, he says, people here live to ripe old ages—Pop, for example, died at 84 in 2002. Lokitis says he just ignores the occasional whiff of sulfur that comes his way. The fire has not reached his house, because, he insists, it's protected by groundwater and rock—and Pop assured him it never would. Pop knew the underground around here like the back of his hand, Lokitis adds.

Centralia continues to hold municipal elections—8 of the town's 12 residents are officeholders. A $4,000 state budget covers maintenance costs, including the clearing of snow. Lokitis mows what used to be neighbors' yards "to keep things looking neat." Near an empty intersection of four-way stop signs that once marked the center of town, a gleaming volunteer fire truck stands ready to roll. "Of course, we don't have any fires to put out," says Mayor Mervine. When the U.S. Postal Service finally revoked Centralia's ZIP code three years ago, Lokitis mounted a fruitless campaign to restore it, then stenciled the extinct code, 17927, on green park benches. And when the United

States invaded Iraq in 2003, someone tied yellow ribbons on four nearby telephone poles. At Christmas, a few former residents faithfully return to set up a manger scene. Lokitis claims many will turn up in 2016 to open a time capsule buried in 1966 next to the veterans' memorial.

In addition to the tourists, scientists come to Centralia as well, to study volcano-like minerals forming around cracks in the soil and to probe for unusual heat-loving bacteria. TV and newspaper reporters show up, seeking offbeat features. Recently, a delegation of Russian scholars studying industrial disasters came calling. "Sometimes you feel like an exhibit," says Lokitis.

Mayor Mervine was pictured in *Esquire* not long ago, over a caption reading: "I ain't leaving." Wild turkeys, hummingbirds, deer and rabbits have replaced crammed-in row houses. Recently, a black bear ambled down South Troutwine. Since no one owns property, no one pays property taxes, and the parking situation could hardly be improved. City councilman John Comarnisky is talking half-seriously about buying a few bison, putting them out to pasture, and promoting Centralia as the Yellowstone of the East. To hear some people talk, the place is coming back.

In his heart, Lokitis may know better. When Pop was buried next to Lokitis' grandmother at St. Ignatius last year, the grandson selected a headstone of polished, jet-black granite—a stone resembling top-grade anthracite. On the monument, a mason etched portraits of the couple, as well as images of St. Ignatius Church, the entry to the R&L Coal tunnel, and the house where Lokitis lives. "I wanted a permanent memorial of this place," he said. Steam rises about 100 feet from his home and seeps even closer from the grave just up the hill. But for now, the grass is still green.

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COAL FIRES

State to Fight Eastern Montana Coal Seam Fires

By AP News, 3-16-09

BILLINGS – State officials say they plan to extinguish nine fires smoldering in underground coal seams in eastern Montana, including a 25-year-old blaze that sparked a large wildfire last year.

The fires are burning in the counties of Custer, Yellowstone, Musselshell, Powder River and Prairie. Two of the fires were confirmed last week and the Montana Department of Environmental Quality suspects more may be burning unnoticed.

The fires typically start where there are exposed outcrops of coal, a relatively common geological phenomenon in coal-rich eastern Montana. Depending on how much oxygen is available, they can smolder underground for years before being noticed.

The one that sparked a wildfire in Musselshell County last year, burning 1,700 acres of around the coal seam, had been smoldering since 1984, a DEQ official said.

"We're not exactly sure how many are out there," said Heather Luinstra with the DEQ. "We're hoping that farmers, ranchers, property owners, if they see anything suspicious on their property they'll give us a call and we can come out and investigate."

Agency officials say putting out the fires by digging up the seams and dousing the coal with water and soil could help prevent future wildfires.

Efforts to extinguish the known blazes will begin in late spring or early summer.

Lightning strikes and wildfires are the main cause of coal seam fires. Others are started by people who use coal mine waste piles for burning trash.

"Most are from a wildfire. There's a wildfire in the area, a tree burns, fire gets in contact with the coal and then the coal ignites," Luinstra said.

Money spent on extinguishing the nine fires will be offset by savings from averted wildfires, said John Koerth, manager for Montana's Abandoned Mine Lands program.

Putting out a coal seam fire generally costs about $40,000-$50,000, although that can vary greatly depending on the size of the blaze, DEQ spokeswoman Mary Ann Dunwell said.

Federal grants derived from fees on coal mined in Montana will pay for the firefighting efforts.

The program that doles out the grants, the Abandoned Mine Reclamation fund, would be phased out in some states including Montana under the 2010 budget proposed by the Obama administration.

Dunwell said Montana stands to lose $121 million over the next 12 years as a result of the phase-out, including money to fight coal seam fires. **[End of article]**

McClatchy Washington Bureau

Print This Article

Posted on Mon, Nov. 17, 2008

China's coal fires belch fumes, worsening global warming

Tim Johnson | McClatchy Newspapers

last updated: November 17, 2008 10:26:41 AM

RUJIGOU, China — The barren hillsides give a hint of the inferno underfoot. White smoke billows from cracks in the earth, venting a sulfurous rotten smell into the air. The rocky ground is hot to the touch, and heat penetrates the soles of shoes.

Beneath some rocks, an eerie red glow betrays an unseen hell: the epicenter of a severe underground coal fire.

"Don't stay too long," warned Ma Ping, a retired coal miner. "The gases are poisonous."

Another miner tugs on the sleeve of a visitor.

"You can cook a potato here," said Zhou Ningsheng, his face still black from a just-finished shift, as he pointed to a vent in the earth. "You can see with your own eyes."

China has the worst underground coal fires of any country on Earth. The fires destroy as much as 20 million tons of coal annually, nearly the equivalent of Germany's entire annual production. The costs go beyond the waste of a valuable fuel, however.

Scientists blame uncontrolled coal fires as a significant source of greenhouse gases, which lead to global warming. Unnoticed by most people, the coal fires can burn for years — even decades and longer — seeping carbon dioxide, methane and other gases that warm the atmosphere.

"Coal fires are a disaster for all of humanity. And it's only due to global warming that people are finally beginning to pay attention," said Guan Haiyan, a coal fire expert at Shenhua Remote Sensing and Geo-engineering Co.

This article is part of an occasional series by McClatchy on how human activities affect global warming. The rising demand for coal worldwide to satisfy a hunger for energy has given way to greater mining, and a proliferation of fires in coal seams and abandoned mines. China, which has tripled coal production in the past three decades, has mobilized thousands of firefighters to combat the 62 known coal fires that are scattered across its north.

Major fires have been extinguished. However, Dutch scientists scribbling back-of-the-envelope calculations say that coal fires in China may still be the cause of 2 to 3 percent of the world's annual emissions of carbon dioxide from burning fossil fuels.

They call for greatly increasing efforts to extinguish China's coal fires — and those in places such as India, Russia and Indonesia — as a practical step to fighting global warming.

"It's a relatively cheap way to stop greenhouse gas emissions," said Horst Rueter, a German geophysicist who's the scientific coordinator for a Sino-German initiative to combat China's coal fires.

Rueter said he thought that China's coal fires accounted for at least half the global emissions from coal fires around the world, making them a steady source of pollutants.

Others said that such runaway fires, while significant, paled beside overall emissions from the United States, a fossil fuel glutton that may give off a quarter of the world's greenhouse gases.

Coal fires can occur naturally and are not a new phenomenon. Australia's Burning Mountain has smoldered for thousands of years. An underground coal fire in Centralia, Pa., began in 1962, eventually opening sinkholes that threatened to gobble and incinerate pets and children. Centralia became a ghost town, and experts say that the fire there may burn for a century or more.

At the Rujigou coalfield in the Ningxia Autonomous Region of western China, fires have burned since the late Qing Dynasty (1644-1911). Legend has it that coal miners who were angry over not being paid started a coal fire more than a century ago.

"It was industrial revenge," Guan said.

Many coal fires begin spontaneously when underground seams come in contact with the air — either through fault lines from earthquakes or mining activity — generating a chemical reaction that can slowly heat and ignite the coal. Human activity is an intensifier of the fires, however, especially when workers abandon dust-filled mines without sealing the airshafts, allowing temperatures to build.

China's coal fires stretch across a northern belt that runs nearly 3,000 miles from east to west. A cluster of them are in Ningxia and a little to the north in Inner Mongolia at the edge of the Gobi Desert. The concentration of coal fires in the region puts it in the running for one of the world's worst ecological disasters, and only humans can extinguish the problem.

"These fires just don't go out," said Anupma Prakash, an expert on mapping coal fires at the University of Alaska at Fairbanks.

Coal fires pollute the air with putrid smoke and wreak havoc on water supplies and aboveground ecology, creating "heat islands" where little vegetation can grow, not even hardy grasses. Wildlife flees.

"There used to be rabbits and pheasants around here, but not anymore," said Liang Guobao, who oversees a generator facility at the San Kuang coal mine in the sprawling Wuda coalfields in Inner Mongolia. His generator powers fans to clear the air in underground shafts.

Liang walked with a visitor around the barren landscape, pointing out places where the ground had collapsed after subterranean coal fires ate away seams and left empty caverns.

"The mine started here in 1958, and almost immediately the fires began," Liang said.

Coal fuels China's roaring economy, powering its factories but also taking a human, social and environmental toll. China uses coal for 70 percent of its primary energy needs, far higher than the world average of 40 percent. China's coal production topped 2.3 billion tons last year, equaling the output of the United States, Russia, Australia and India combined, said Yang Fuqiang of the Beijing office of The Energy Foundation, a San Francisco group that promotes energy efficiency.

Even as it provides power, coal exploitation leaves a trail of deaths.

Last year, 3,786 Chinese miners died in accidents, a rate 70 times higher than for miners in the United States.

Coal burning is a principal cause of air pollution in China, where 400,000 people die each year from illnesses related to that pollution, the World Bank estimates, mainly heart and lung diseases.

For those who grew up in the region, the scarring of the hilly environment from unseen coal fires is part of the landscape. Ma recalled walking in the hills as a youth and discovering long, deep fissures in the earth.

"We wouldn't know how deep they were. If we dropped a stone in, we could hear it bounce off the walls . . . but we couldn't hear it hit bottom," Ma said.

As much as 40 percent of China's coal comes from small local mines rather than big state-owned enterprises. Small operators follow a pattern when their mines catch fire.

"When they have a fire, they just leave and go to another place," said Li Jing, the director of the Institute of Resource Technology at Beijing Normal University.

Over the past decade, China has put far greater emphasis on attacking coal fires. The work is labor intensive, costly and dangerous in its initial stages. The blazes can reach underground temperatures of 1,300 to 1,500 degrees Fahrenheit, imperiling firefighters.

"First, they shape the terrain and cool down the surface so the heavy machinery can work," Rueter said. Teams drill holes down through the burning coal in 50 to 60 spots and inject water for several months "to cool down the entire rock volume."

Later, they may make up a slurry of sand, water, cement and some chemicals, and pour it into the holes. Once the fire is out, the entire rock area must fall below 158 degrees Fahrenheit to ensure that the coal doesn't reignite. A layer of clay is put on top and trees planted to gauge whether the fire has begun anew.

Prakash, the coal fire expert in Alaska, said she thought that worldwide efforts to combat coal fires had fallen short.

"The coal exploration is more intense than the coal firefighting efforts," she said. "In the areas I have seen — China, India, Indonesia, South Africa — they haven't gotten any better."

China is sensitive to charges that it may not be doing enough to put out the fires.

Fourteen months ago, it announced with fanfare that it finally had put out the Rujigou coal fires that had burned for decades. A story from Xinhua, the official news agency, said the state had spent $53 million over a decade to douse the fires.

A visit to the site, however, showed that the fires weren't completely extinguished.

"The leaders said they'd put out all the fires," said one miner, declining to give his name for fear that he'd be fired for exposing a falsehood.

"There are many reasons" that the work never was completed, he said. "One reason is that the investment to put out the fires was not enough. And the leaders changed too frequently."

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Why Carbon Sequestration Won't Save Us

by Michael Graham Richard, Gatineau, Canada on 07.31.06

{Note by Dale Ferguson: This article was copied from http://www.treehugger.com/files/2006/07/carbon_sequestration.php, It consists mostly of quotes from "The Weather Makers," by Tim Flannery. On first reading it wasn't obvious to me that Michael Graham Richard was quoting Tim Flannery; the formatting is obscure (maybe because we have an American reading a Canadian quoting an Australian). The "Treehugger" Website wouldn't permit this piece to be printed, so I copied and pasted, and then reformatted for readability.}

Carbon sequestration, also known as geosequestration, seems like a good deal. "Have your carbon cake and eat it too." In principle, it works this way: You capture CO2 emissions at the source before they are released into the atmosphere, compress them until they become liquid and then inject them in deep underground holes. What could be simpler? It certainly sounds like a good tool to fight global warming while enjoying the Earth's huge coal reserves.

I used to think that it would indeed be one of the many solutions used to save ourselves from catastrophic climate change, but not anymore. In fact, I now think that it might be a counter-productive red herring. What has made me change my mind? What's the problem? Read on, please.

Tim Flannery, in his highly recommended book The Weather Makers, dedicates a chapter to engineering solutions to global warming. In it, he gives an overview of carbon sequestration technology, the problems that have to be solved before it can work, and what the coal industry has been doing so far.

Here are the problems in order:

First, from the smokestack:

> *"The stream of CO2 emitted there is relatively dilute, making CO2 capture unrealistic. The coal industry has staked its future on a new process known as coal gasification. These power plants resemble chemical works more than conventional coal-fired power plants. In them, water and oxygen are mixed with the coal to create carbon monoxide and hydrogen. The hydrogen is used as a fuel source, while the carbon monoxide is converted to a concentrated stream of CO2. These plants are not cheap to run: around one-quarter of the energy they produce is consumed just in keeping them operating. All indications suggest that building them on a commercial scale will be expensive and that it will take decades to make a significant contribution to power production.*
>
> *"So about 25% of the energy they make is used just to keep them operating, they are more expensive and it will take decades (an amount of time we don't have) before they make a significant contribution. Meanwhile, old coal power plants have an average lifetime of 60 years."*

What's next?

> *"Let's assume that some plants are built and the CO2 is captured. For every tonne of anthracite [coal] burned, 3.7 tonnes of CO2 is generated. If this voluminous waste could be pumped back into the ground below the power station it would not matter as much,*

but the rocks that produce coal are not often useful for storing CO2, which means that the gas much be transported. In the case of Australia's Hunter Valley coal mines, for example, it needs to be conveyed over Australia's Great Dividing Range and hundreds of kilometres to the west. [pipelines cost about $1 million per mile, more when terrain is rough and uneven.]

"Once the CO2 arrives at its destination it must be compressed into a liquid so it can be injected into the ground—a step that typically consumes 20 per cent of the energy yielded by burning coal in the first place. *Then a kilometre-deep hole must be drilled and the CO2 injected.* ***From that day on, the geological formation must be closely monitored;*** *should the gas ever escape, it has the potential to kill. [...]*

"The largest recent disaster caused by CO2 occurred in 1986, in Cameroon, central Africa. A volcanic crater-lake known as Nyos belched bubbles of CO2 into the still night air and the gas settled around the lake's shore, where it killed 1800 people and countless thousands of animals."

Okay, so even more energy is lost by compressing the CO2 to liquid form and we must monitor for leaks. What else?

"Earth's crust is not a purpose-built vessel for holding CO2, and the storage must last thousands of years so the risk of leak must be taken seriously.
Even the volume of CO2 generated by a sparsely populated country such as Australia beggars belief. Imagine a pile of 200-litre drums, ten kilometres long and five across, stacked ten drums high. [1.3 billion drums] Even when compressed to liquid form, that daily output would take up a cubic kilometre, and Australia accounts for less than 2 per cent of global emissions! ***Imagine injecting 50 cubic kilometre of liquid CO2 into the Earth's crust every day of the year for the next century or two.***

"If geosequestration were to be practised on the scale needed to offset all the emissions from coal, the world would very quickly run out of A-grade reservoirs near power stations and, especially if the power companies are not liable for damages resulting from leaks, pressure would be on to utilise B, C, D and E grade reservoirs."

Okay, so burying it in the ground is not so simple or safe—as the oil industry likes to remind us, drilling is expensive—and it's not a long-term solution since we will run out of convenient places to sequester the liquid CO2. Anything else?

"All of this suggests that the best case scenario for geosequestration is that it will play a small role (at most perhaps 10 per cent by 2050) in the world's energy future.

"Because action is needed now to combat climate change, both the public and the marketplace need to see proof of geosequestration's potential. ***Big coal should already be building trial coal gasification plants with geosequestration as a test of the economic and technological viability of their approach. Yet, despite offers of government assistance, very little is happening with geosequestration.*** *[...]*
Imagine the cost of building the new generation coal gasification power plants, the separation, storage, pipelines, compressors and injection wells."

So they're not even rushing to test it and make it happen?

> *"Politicians have been seduced by the coal industry's spin. [...] the Australian government set up [behind closed doors] a $500 million research fund for low emission technologies, precisely tailored in its brief to accommodate geosequestration.* ***That's half a billion dollars that will never be fairly shared between all energy options to ensure the best outcome for the nation.*** *[...]*
>
> *"What is at stakes is [...] that Australia must increase its power production by more than 50 per cent by 2020 (a slow rate of growth compared with China [the biggest coal user in the world]), and the coal industry would like to secure as large a share of the cake as possible."*

All this talk of carbon sequestration can basically be seen as a delaying tactic, as a way to get government support and to keep the operation and construction of coal power plants more socially acceptable. It's the equivalent of saying: "Don't bother us, we're working on it!"

But even if we suppose that big coal starts to build the expensive gasification plants soon and that they can solve most of the technical problems with geosequestration, they are not saying that they want to replace old, extremely dirty plants with the new ones; they want to build new ones and keep the old ones. They almost certainly won't bear the liability of CO2 leaks from underground storage, so that's an extra cost for taxpayers, not to mention that the electricity coming from coal gasification plants that do carbon sequestration will be more expensive because a lot of energy is lost in the process of running the plants, in the actual sequestration operating, and the huge costs of building the pipelines, the plants, drilling the holes, maintenance & monitoring, etc, will be passed on to the customers (or they'll ask for subsidies—same difference).

So it'll take decades which we don't have, be extremely expensive, probably won't work that well, and we'll run out of good burying sites before long. Meanwhile, the clean energy industry (solar, wind, wave, geothermal) will keep growing very fast at exponential rates, their costs will keep going down and the efficiency of their production units (wind turbines, solar panels, hydrokinetic buoys, Gorlov helical turbines, geothermal heat pumps) will keep going up.

The fastest and cheapest way to close down coal plants soon is probably investments in efficiency. Remember, it's a lot cheaper to save a watt of electricity than to produce one.

As a ~~society civilization~~ [sic] species, we must back the right horse and stop being misled by the coal industry's delaying tactics. There's a big opportunity cost in time and resources to going down the wrong path. Each new power plant big coal builds means decades of fat profit for it, but for the rest of us here on Earth, it's just bad, bad news.

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by Michael Graham Richard, Gatineau, Canada on 07.31.06

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